Consequences of the Armed Conflict as a Stressor of Climate Change in Colombia

Diana Contreras [1], Sandra Contreras[2]

[1]*UNIGIS Latin America/University of Salzburg, Salzburg, Austria. E-mail: diana.contreras@team.unigis.net*

[2]*Press/Grupo Planeta, Bogotá D.C., Colombia. E-mail: scontreras@planeta.com.co*

ABSTRACT: The internal armed conflict in Colombia reduces the resilience of the community to face the consequences of climate phenomena such as La Niña, which occurred in Colombia, between 2010 and 2011. I selected a case study area in Colombia based on previous studies in the topic of deforestation due to illegal crops. Correlation and regression analysis are employed to demonstrate the relationship between the rates of deforestation, the number of affected households and the events of violence. The statistical analysis explores the rate of deforestation between 2002 and 2007, the number of affected households due to La Niña phenomenon in 2010-2011, and the number of events related with armed violence occurred between 2012 and 2013. A significant correlation (+0.865) exists between the number of La Niña affected households, and the number of violent events two years later. No correlation exists between the rate of deforestation, neither with the number of affected households, nor with the events of violence. Moreover, we demonstrated that the number of households affected accounts for 74.8% in the number of events related with armed violence. In conclusion, the problem is not the hazard or the intensity of the phenomenon, the real problem is the low resilience of the communities affected by La Niña that are simultaneously involved in the internal conflict of Colombia. Communities involved in forced displacement are not able to construct social capital, in order to develop capacity to anticipate, respond to, and recover from hydro-meteorological events related to climate change, or any other natural phenomena.

Keywords: armed conflict, climate change, La Niña, resilience, deforestation, Colombia.

1. INTRODUCTION

In Colombia there have three kinds of illegal armed groups: guerrilla groups, paramilitary forces, and criminal gangs. The guerrilla groups began operating in Colombia more than 50 years ago, while the paramilitary forces appeared in the middle of the 1990's, as response of the farmers, cattle ranchers, and drug-traffickers to systematic extortion by the guerrillas to fund their illicit activities. After the process of disarmament and demobilization of paramilitary groups, which started in 2003, some of the members have decided not to reintegrate into civilian life and begin lives in organized crime.

The paramilitary groups are mainly present in the north, the west and in the central region of Colombia, while guerrilla is mainly located in the east and the south of Colombia. The areas where these groups operate have in common, resources such as land, minerals, and transport corridors used for traffic of drugs. The land is needed to grow illicit crops such as marijuana, coca, and to a lesser degree poppy. The boom of the illicit crops in Colombia started since the middle of the 1960's. The west and the north-east of Colombia constitute drugs traffic corridors, and the culture of violence and armed conflict in these areas is rooted in the drug trade (González, 1999).

Illicit crops and illegal mining activities usually take place in remote areas, making it difficult for police to locate and the government to eradicate. To develop illicit crops, large tracts of land are deforested every year, contributing to floods, land degradation and reduction of fresh water availability. Already in the 90's, González (1999) highlighted that Colombia had one of the highest deforestation rates in the world, caused mainly by the illicit crops, besides the expansion of the agricultural frontier, the new settlements, extensive livestock, and illegal mining (Herrera, 2013). It is estimated that three hectares are deforested to implement one hectare of coca (Contreras, 2008).

Between 2010 – 2011 La Niña phenomenon dominated in Colombia, four million Colombians, or 9% of the total population were somehow affected. By May 2011, 448 people had died, 524 were injured, and 73 people were reported missing. There were 447,482 houses damaged, and 13,110 houses were totally destroyed. The economic loss estimated at US$7.8 billion, representing damage of infrastructure, flooded crops, and financial assistance to affected people. The high number of people affected in municipalities located in the lower Magdalena River, and Atrato River are the result of not only the hazard exposure, but also to the high social vulnerability. In these zones, the social vulnerability is intensified by internal armed conflict (Hoyos et al., 2013).

The government stated that environmental problems are related with the deforestation rate in Colombia (0,25%), which according to UN is nearly the double of the global average (0,16%). These problems are concentrated in the same departments, in which floods and droughts have taken place in the last years (Billar and Fontalvo, 2014).

2. HYPOTHESIS

Illegal armed groups with their activities related with illicit crops and illegal mining, contribute not only to the degradation of the environment, but also to stress the consequences of regular climate phenomena such as La Niña.

3. METHODOLOGY

To administrative purposes, Colombia is divided in departments. Taking into account the contribution of deforestation to the floods (Reuveny, 2007), for the analysis, only the set of departments from Colombia with problems regarding deforestation in the period between 2002 and 2007, are considered (SINCHI, 2010): Caquetá, Meta, Guaviare, Putumayo, Amazonas, Vichada Vaupés, Cauca, and Nariño. This set of departments which made up our case study area, are the same considered in a previous study by Armenteras and Retana (2012). These authors demonstrated the correlation between fires for land clearing, deforestation, cattle ranching, illicit crops, other crops and the presence of people, including armed and illegal groups. However, the same authors admitted that the spatial relationships of the climate and fire variables in the different years did not show similar patterns, and the relationships between precipitation anomalies (accumulated rainfall) and fire hotspots were also not consistent during the same period. The case study area is depicted in Figure 1.

Fig.1: Case study area in Colombia.

Besides the yearly average rate of deforestation per Km^2 in each department of the case study area, we took the corresponding number of affected households due to La Niña phenomenon between 2010 and 2011 (CEPAL, 2012), and the number of events of violence, which took place in the same departments between January 1st, 2012 and July 15th 2013 (Baracaldo Orjuela, 2013). The data collected is presented in Table 1.

Table 1: Comparison of the number of Km^2 deforested in Colombia between 2002 and 2007, the number of affected households by La Niña phenomenon between 2010 and 2011, and the number of events of armed violence between 2012 and 2013.
ND: No data.

DEPARTMENTS	DEFORESTATION 2002 - 2007 Km2	AFFECTED HOUSEHOLDS 2010 - 2011 Number	ARMED VIOLENCE 2012 - 2013 Number of events
Caquetá	2093,36	6248	339
Meta	1711,84	5545	213
Guaviare	1315,26	95	60
Putumayo	1090,48	4171	221
Amazonas	413,89	695	0
Vichada	ND	ND	6
Vaupés	257,08	3	3
Cauca	91,58	71220	657
Nariño	41,06	47438	331

4. RESULTS

We can express the relationship between variables statistically by looking at the correlation coefficient. In spite that the correlations are a powerful research tool, it is still essential to perform a regression analysis in order to test the predictive power of the variables chosen.

4.1 Correlation analysis

Statistically, we demonstrated the correlation between the number of affected households, and the number of violence events afterwards (+0.865). There was not correlation between the rate of deforestation, neither with the number of affected households, nor with the events of violence. The correlation analysis is presented in Table 2.

Table 2: Pearson's one-tailed bivariate correlation between the number of Km^2 deforested in Colombia from 2002 to 2007, the number of affected households by La Niña phenomenon between 2010 and 2011, and the number of events of armed violence between 2012 and 2013.

		DEFORESTATION 2002 - 2007	AFFECTED HOUSEHOLDS 2010 - 2011	ARMED VIOLENCE 2012 - 2013
DEFORESTATION 2002 - 2007	Pearson Correlation	1	-,423	-,031
	Sig. (1-tailed)		,129	,471
	N	9	9	8
AFFECTED HOUSEHOLDS 2010 - 2012	Pearson Correlation	-,423	1	**,865****
	Sig. (1-tailed)	,129		,003
	N	9	9	8
VIOLENCE 2012 - 2013	Pearson Correlation	-,031	**,865****	1
	Sig. (1-tailed)	,471	,003	
	N	8	8	8

**.Correlation is significant at the 0.01 level (1-tailed).

4.2 Regression analysis

In the regression analysis of number of affected households affected and violence, R has a value of 0.865. The value of R2 is 0.748 which demonstrates that the number of affected households due to la Niña phenomenon account for almost 75% in the number of armed violence events in the case study area afterwards. The value of the correlation coefficient or R, and the derived R2 for the model are presented in Table 3.

Table 3. Regression analysis between the number of affected households by La Niña phenomenon in Colombia between 2010 and 2011, and the number of events of violence in the departments of the case study area.

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	AFFECTED HOUSEHOLDS[b]	.	Enter

a. Dependent Variable: ARMED VIOLENCE
b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.865[a]	**.748**	.706	118.7693

a. Predictors: (Constant), AFFECTED HOUSEHOLDS

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	25,0736.584	1	25,0736.584	17.775	.006[b]
	Residual	84,636.916	6	14,106.153		
	Total	335,373.500	7			

a. Dependent Variable: ARMED VIOLENCE

b. Predictors: (Constant), AFFECTED HOUSEHOLDS

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	111.155	50.411		2.205	.070
	AFFECTED HOUSEHOLDS	.007	.002	.865	4.216	.006

a. Dependent Variable: ARMED VIOLENCE

4. ADDED VALUE FOR INTEGRATIVE RISK MANAGEMENT AND URBAN RESILIENCE

Our work supports the development and strengthening of institutions, mechanisms and capacities to build resilience to hazards. This strategic goal is defined in the Hyogo Framework for Action. There are feedback loops between violence and climate change and subsequent impacts on livelihood resilience (Tellman et al., 2014).The forced displacement of the community makes it difficult to develop capacity to face hydro-meteorological events related to climate change.

5. CONCLUSIONS

The problem is not the hazard or the intensity of the natural phenomenon, the real problem is the low resilience of the communities involved in the internal conflict of Colombia, when they have to face an extreme climate phenomenon such as La Niña. To construct social capital and develop resilience to face phenomena such as La Niña and El Niño, it is necessary to increase the presence of the government in the areas where there are natural resources, which are usually geographically far from the institutional control. One of the most urgent policies in Colombia is a land reform beside the process of land restitution, and more support for the farmers.

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